openreach

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Suppliers' Information Note

For The Openreach Network

Street Access 1Gbps Sync Product

Service & Interface Description

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1. Introduction

This Suppliers' Information Note (SIN) describes the interface provided with the Openreach 1Gbps Street Access services, referred to as "Street Access 1G Sync". Also provided is some general information on the Street Access product family and some physical aspects of the NTE being deployed for Street Access 1G customer orders.

Street Access services are new "active" 1Gbps point-to-point dedicated and managed data circuits that are permanently connected and available 24 hours a day, 365 days a year. Street Access provides secure links between combinations of end user sites effectively street furniture/lamp posts, and Communications Providers' (CPs') sites and/or BT exchanges, providing "full on path support" for phase synchronisation.

Any specific technology mentioned in this document is current as of today. However, it may be subject to change in the future. Should the specification of the interface be changed, this will be notified by a new issue of this SIN. Openreach reserves the right to adapt technology to deliver Street Access as new developments are made. All services are delivered over an uncontended transmission path.

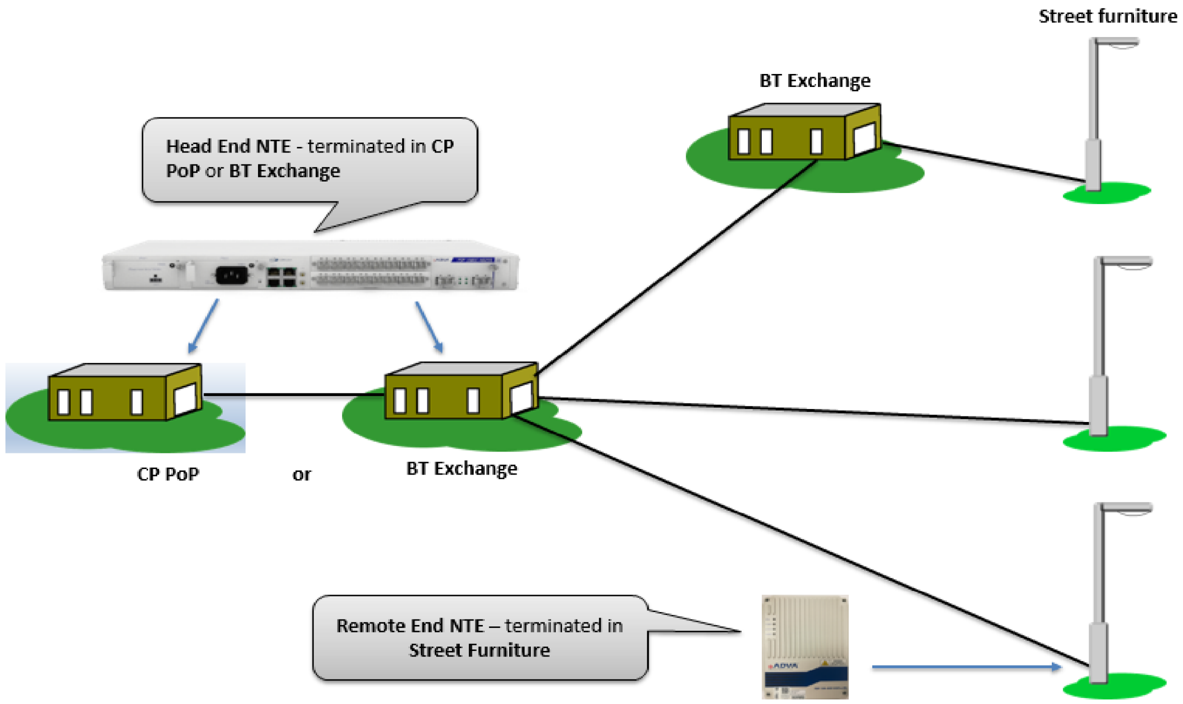
2. Service Outline

2.1 General

The Street Access 1G Sync service operates at a speed of 1000 Mbps in full duplex mode between sites.

Street Access 1G Sync service is a point-to-point data service offering high bandwidth connectivity over a standard radial distance up to 25km between sites. This radial (or point-to-point) distance can result in physical line plant route distances of up to 40km.

A schematic of the Street Access 1G Sync service is shown in Figure 1. Site A is usually a BT Exchange end, Site B is usually housed in street furniture/non-environmentally controlled location.


Street furniture
BT Exchange
Head End NTE - terminated in CP PoP or BT Exchange
CP PoP
or
BT Exchange
Remote End NTE – terminated in Street Furniture

Note: The remote-end NTE can be terminated in Street Cabinets and other non-environmentally controlled environments. The diagram uses a lamppost termination for illustrative purposes only.

Figure 1 Simplified Network Diagram

It is envisaged that CPs / customers will use this service for the interconnection of Gigabit Ethernet between street furniture mounted devices and a BT exchange or CP PoP site.

3. Interface Descriptions

3.1 General

Gigabit Ethernet conforms to the IEEE 802.3 standard. Autoneg is enabled at both ends. Local end presentation to the Communication Provider (CP) is via singlemode or multimode dual LC optical presentation. The remote site presentation to the CP is via RJ45 connection only, 1000Base-T, Master. Hence the customer must set their interface to Auto 1000Full Slave. Auto MIDX is active on the RJ45 handover facing the CP. CAT5E RJ45 cables must be used when connecting up to this service.

3.2 Optical Connector (Headend NTE)

The interface is the Network Termination Point (NTP), i.e. the point of connection on the Openreach Network Terminating Equipment (NTE) for connecting Customer Premise Equipment (CPE).

Client Interface will always be a Dual LC type 1000BaseSX or LX fibre interface optical port. The CP / customer provides the fibre patch connectors between

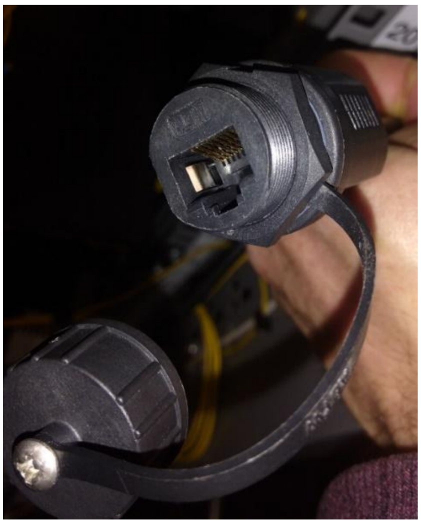
NTE and CP equipment/CPE. The maximum fibre length between the NTE and CP equipment/CPE is 220m for 850nm multimode ports if 62.5/125 micron optical patch cords are used. For 1310nm single-mode ports, the maximum fibre length is 10km when a 9/125 micron optical patch cable is used.

Attention is drawn to the Intellectual Property Rights (IPRs) set out in the preface of this agreed International standard. It is the responsibility of the supplier of the CP equipment or CPE to ensure that they have the necessary rights from the owner of the IPR.

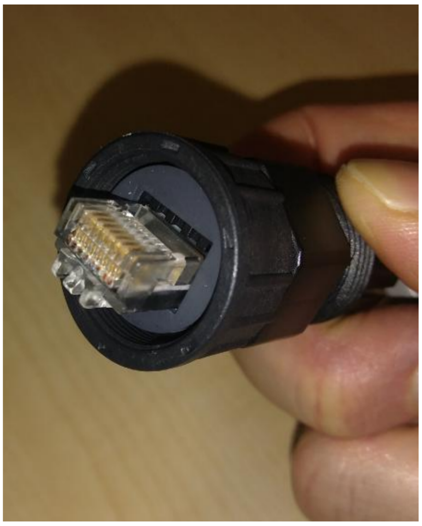
3.3 Connector Type (Remote NTE)

The remote end is an RJ45 handover. The customer should present a male RJ45 waterproof amphenol connector for connection into the Street Acces service. The female presentation for the Openreach service is pictured below left, the customer should provide connector below right.

RJ45 Presentation from Openreach NTE



Required RJ45 connection from customer



3.4 Transmission

Note: The definition of frame length includes the 4-byte CRC but does not include any preamble.

The Street Access NTE is capable of transmitting frames confirming to IEEE 802.3[1] with frame sizes 64 bytes to a maximum of 2000 bytes as specified in IEEE 802.3[1] and amendment IEEE 802.3as[4]. This is to maintain compatibility with a number of frame tagging formats, including VLAN tagging as specified in IEEE 802.1q[2] and IEEE 802.1ad[3].

In-order to enhance the customer experience, we propose to offer 99.9% throughput for all frame sizes with ability to send untagged, single tagged and double tagged frames. Customers will be able to send outer VLAN tags in range 0-4093 (both inclusive). VLAN 4094 will be used for managing the Street Access NTE and thus cannot be used by the customer.

The NTE does not have the capability to intercept and/or view 'customer data'.

Note: The Street Access NTE will pass 9000 byte frames on Gigabit interfaces only however as this is not yet a recognized Ethernet standard, Openreach will not validate usage at this level until such time as the IEEE provide an endorsement and published standard for jumbo frames and we have tested against it.

3.5 Frame Forwarding Behaviour

The Street Access service does not include IEEE 802.1d[5] Bridging functionality, which would allow for the Learning and Filtering of traffic packets destined for those hosts connected at the local end]. Therefore Ethernet frames that would normally be filtered by IEEE 802.1d[5] bridging functionality, are instead forwarded across the Street Access link.

3.6 Street Access Transparency Restrictions

All Ethernet frames are passed across the Street Access link, other than the following list of known exceptions:-

1. Transport of EFM OAM PDUs as defined by IEEE 802.3[1] over Street Access is not supported
2. The Street Access service uses EFM OAM PDUs internally for the purposes of OAM. And as per the IEEE802.3[1] standards defined behaviour for EFM equipment, the end to end transport of customer EFM OAM PDUs over the Street Access link is blocked.
3. Transport of Ethernet flow control / Pause frames over Street Access is not supported
4. Transport of Auto-negotiation messages over the Street Access link is not supported.
5. Auto-negotiation messages are exchanged and terminated between the NTE's client interface and the customer equipment to which it is directly connected.

3.7 Auto-Negotiation and Duplex Settings

The NTE customer interface will require customer equipment Ethernet interface to be set to Auto-negotiate. The NTE will advertise its speed and duplex settings, however the NTE will not allow speed or duplex settings to be set by customer equipment. Half duplex is not supported. At the remote site, auto-negotiation required for the 1000M RJ45 handover, as specified in IEEE 802.3[1]. Additionally, at the remote site, the customer must set their equipment to operate at as "Auto 1000 Full Link Slave", to ensure the timing messages are propagated correctly.

3.8 Network Link Loss Forwarding

When a break is detected on the Openreach network link, the customer side connection at the local and remote ends will be forced hard down (i.e. light will not emanate towards the customer from the port at the local end, and the RJ45 port will be powered off at the remote site). This continues until such time as the network break is repaired.

Please note:- Access ports that take in the Sync timing feed from the customer will not have port down LLF fault propagation, because this would disconnect the incoming timing feed, that is used for other services.

3.9 User-User Link Loss Forwarding

User-User Link Loss Forwarding (Fault propagation) is an optional configuration at time of order and available as unidirectional only. Note any disconnection/deactivation of Access ports will result in Sync going into holdover state – with wait to restore recovery period once the Access link is up again.

Please note: - The Access ports that take in the Sync timing feed from the customer will not have port down LLF fault propagation, because this would disconnect the incoming timing feed, that is used for the other services. LLF direction from remote street access NTE towards headend NTE will not be offered on the access ports that take in Sync timing feed.

3.10 Circuit Protection

Resilience Option 2 (RO2) is available for the service.

Resilience Option 2 (RO2) consists of two individual Street Access service delivered using diversely routed fibres between the same circuit A-end and B-end addresses, or between the same A-end and different B-end addresses. Note that the two street access service in an RO2 configuration do not perform an automatic protection switching.

Note: Resilience Option 1 (RO1) is not available.

4. Environmental Specifications

4.1 General

The temperature and humidity range of the environment used to house the 1U Head end NTE must not exceed the following:

- Ambient housing temperature: 0°C to +40°C
- Relative humidity 5% to 95% (non-condensing)

Headend NTE has variable speed fan cooling.

The dimensions of the 1U headend NTE are 443mm x 44.4mm x 220mm (W x H x D) Weight 5.6 kg.

The Temperature and humidity range of the environment used to house the street furniture mini-NTE must not exceed the following:

- Ambient housing temperature: -20°C to +65°C
- Relative humidity 5% to 100% (including condensing)

Physical features of mini-NTE are as follows:

- IP67 rated once the installation is finalised with all connectors installed
- ETSI 300 019 class 3.5 [6]
- Compliant with EN 300 386 (Requirements for locations other than telecommunications centres) [12]
- Passive Cooling
- The dimensions of the remote NTE are 100mm x 145mm x 65mm (W x H x D) Weight 0.75 kg.
- Openreach mini NTE comes with a mounting plate for fixing onto a backboard already fitted. It can be wall, pole/lamppost or cabinet mounted.

NOTE: The remote NTE must not be exposed to direct sunlight, so must be, for example, mounted within Street Furniture.

5. Power Supply & Installation

5.1 General

By placing an order, the CP has accepted the conditions placed by Openreach in relation to providing power, as defined below.

In relation to powering of equipment, the CP must comply with the requirements of BS7671 [13] and the details given within the "DC Power Planning and Installation Guide for WES-BES Products' document.

5.1.1 Headend NTE

The Openreach Head end 1U NTE is locally powered and offers AC or DC power options. The CP will be required to provide either dual local 50Hz 240V AC supply in the form of standard 13A power socket(s); or dual -48 V DC power distributions and Earth connections, with all wiring colour schemes conforming to BS7671. It will be the CP's responsibility to ensure that the power supplies are fused and safe for Openreach to use. These should be in close proximity to the NTE installation location.

5.1.2 Remote end NTE

The Openreach Mini NTE is locally powered in the street furniture via an AC to DC converter that must provide 12V DC, SELV source only. Please see section 5.3 for detailed requirements.

For the product, the CP will provide a DC power supply (PSU) which they are responsible for installing prior to installation of the remote NTE. The CP is also responsible for providing the AC to DC converter and maintaining the PSU.

5.2 Installation and Testing

5.2.1 Headend NTE

In addition to the NTE powering requirements (i.e. AC or DC power as defined below), a spare 50 Hz 240V AC mains supply 13A socket should also be provided in close proximity to the NTEs' to power Openreach test equipment during both initial commissioning and subsequent maintenance support activities. A 50 Hz 240V mains supply 13A socket should also be provided in close proximity to the NTE for the management router.

5.2.2 AC Power connection – Head end NTE only

AC power connection between Openreach 1U Head end NTE equipment and the power socket will be made using a power lead fitted with a standard 13A plug. The NTE itself has dual power supply units internally, and requires two AC mains supply sockets running off the same phase.

For most installations, this will require two mains connections for each NTE provided, and the consumption of the Openreach NTE in this managed service arrangement will typically be 63W per NTE. An additional AC mains supply socket will be required for the management router.

5.2.3 DC Power Connection – Head end NTE only

The DC in-Line (Molex) connector is specified as the standard method of connecting DC power by Openreach, and represents the "Demarcation Point" between Openreach and the customer. At A end site the customer is required to provide suitable power and earth connection to, and be responsible for the supply, wiring and labelling to, the demarcation point. Openreach will not supply or install the DC distribution system as part of the standard Ethernet installation.

5.2.3.1 CP-provided wiring up to the Openreach specified In-Line Connector

Wiring, MCB isolation or fuse (i.e. C type MCB or Cartridge Fuse) must be provided by the customer, up to and including the DC in-line connector, as per Openreach's requirements stated within the DC Power Planning and Installation Guide for WES-BES Products document with respect to:

i. Correctly rated MCB/Fuse (6A),

ii. Correct labelling of wiring and MCB/fuse positions compliant with BS 7671 [13]

iii. Correct size of cable for required voltage drop at required maximum current

iv. Separately fused isolatable A & B power supplies, as detailed in the 'AC/DC Power Planning and Installation Guide' document

An additional AC mains supply socket will be required for the management router. Currently the management router is AC powered only.

5.3 Remote End NTE used in street furniture only

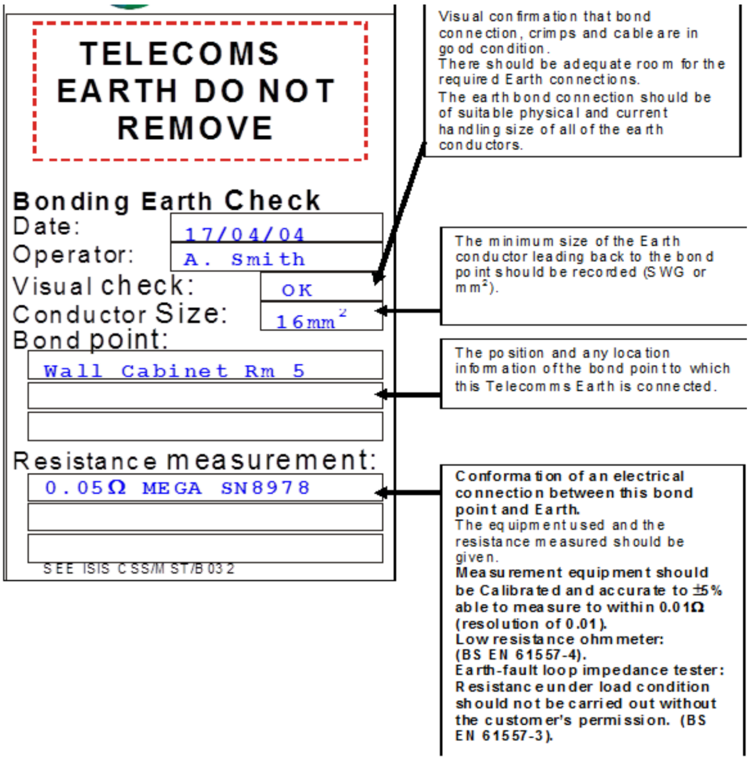
The applicable wire gauge for the 12volt DC feed is minimum AWG 18 (0.823mm^2). The Street furniture NTE must be earthed to ETSI EN 50310 standard, using the Earthing lead provided with the NTE. The earthing lead (ground wire) used on the mini-NTE must be a minimum of AWG 10 (5.26mm^2) for installations within street furniture or inside mounting.

The DC lead on the PSU uses AWG 18.

The remote NTE is fitted with an AWG 10 earth lead which is suitable for all the recommended deployment locations (inside a pole, street cabinet, street furniture, indoors etc.).

It will be responsibility of the street furniture owner to ensure:

a) The furniture is earthed according to an acceptable standard ETSI EN 50310
b) Any metallic exterior should be bonded to earth.
c) The earth is tested prior to connection of any Openreach equipment. Openreach will not connect unless the earth is proven to be good. Bonding earth check should be undertaken as shown in below label.



TELECOMS EARTH DO NOT REMOVE

Bonding Earth Check

Date: 17/04/04

Operator: A. Smith

Visual check: OK

Conductor Size: 16mm²

Bond point:

Wall Cabinet Rm 5

Resistance measurement:

0.05Ω MEGA SN8978

SEE ISIS CSS/MST/B 032

Visual confirmation that bond connection, crimps and cable are in good condition.
There should be adequate room for the required Earth connections.
The earth bond connection should be of suitable physical and current handling size of all of the earth conductors.

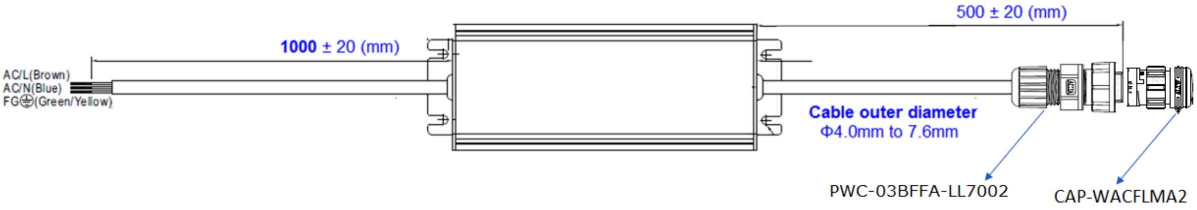
The minimum size of the Earth conductor leading back to the bond point should be recorded (SWG or mm²).

The position and any location information of the bond point to which this Telecomms Earth is connected.

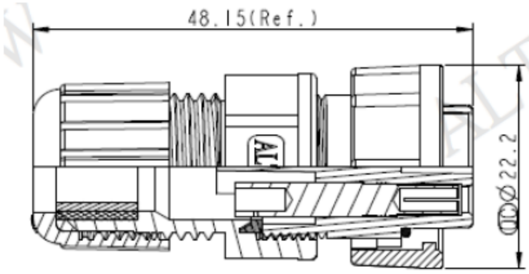
Conformation of an electrical connection between this bond point and Earth.
The equipment used and the resistance measured should be given.
Measurement equipment should be Calibrated and accurate to ±5% able to measure to within 0.01Ω (resolution of 0.01).
Low resistance ohmmeter: (BS EN 61557-4).
Earth-fault loop impedance tester: Resistance under load condition should not be carried out without the customer's permission. (BS EN 61557-3).

Required PSU

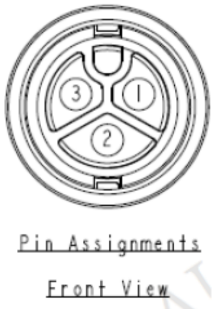
The CP is responsible for providing the PSU to power the street furniture NTE (similar to below) and for its UMSUG registration.



The connector type for the 12V DC connection that the customer must present at their PSU (to mate with the street furniture NTE) is a female Amphenol TW connector: PWC-03BFFA-LL7002as shown below:


48.15(Ref.)
Ø22.2
ALTW

PWC-03BFFA-LL7002


3
1
2
Pin Assignments
Front View

Pin out:

3 = 0v DC

1 = +12v DC

2 = Not connected

Female connector presented from customer provided PSU

Amphenol LTW

Male connector presented from Openreach NTE

Amphenol LTW

The PIN-out diagram above for the electrical 12vdc PSU, refers to the female Amphenol TW connector: PWC-03BFFA-LL7002 that should be presented from the customer provided PSU.

The CP is responsible for making sure the PSU meets all necessary safety, environmental, emissions and immunity requirements relevant for the deployment site. The DC output to the NTE must meet the following minimum electrical characteristics:

Output Characteristics

Item	Technical Requirement	Unit
Output voltage	12	V
Tolerance	±3%	%
Output Power	≥30	W
Efficiency	≥85	%
Ripple, Noise, and discrete frequency noise	±250	mV
Holdup-Time	≥ 16	mS

Protection Characteristics

Item	Technical Requirement
Output overvoltage protection point	Yes
Output over-current protection point	Yes
Short circuit protection	Yes
Over temperature protection	Yes
Fire protection	Yes

The PSU provided shall be compliant with the following EU Directives and be appropriately CE marked. Evidence of compliance (for example DoC) shall be provided to Openreach:

- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive 2014/30/EU
- Restriction of Hazardous Substances in Electrical and Electronic Equipment - Directive 2011/65/EU

6. Synchronisation and PTP support

The Street Access 1G Sync service will transport a clock input from the headend through the network to produce a matching clock output at the other end of the service. Providing and maintaining the timing source is the CP’s responsibility. The Street Access service supports;

- Synchronisation at the Physical layer, ITU-T G.8261 [7]

- Supports clock requirements at as specified in ITU-T G.8262 [8]
- Supports messaging requirements as specified in ITU-T G.8264 [9]
- Supports full timing support as specified in ITU-T G.8275.1 [10]
- Supports boundary clock as specified in ITU-T G.8273.2 [11]
- Multiple timing domains on the NTE are not supported

For the headend and remote NTE, Synchronous Ethernet (SyncE) with Precision Time Protocol (PTP) is a mandatory feature which will transport a clock source, provided by the CP, across the service to enable time and phase recovery.

Both features (SyncE and PTP) are enabled by default. Customers cannot select to only take one feature without the other.

A maximum of two traffic ports may be used for input clock feeds (i.e. a primary and a back-up feed) per headend NTE. Only a single input clock feed is supported on each line card. Therefore a back-up feed would require that a second line card is in slot 2 on the NTE. The back-up feed is only available to order when the customer places an order for the Fifth circuit. Only one timing domain is available per NTE per card.

The synchronisation output at the far end of the service will be on the Ethernet traffic port. At the local end - the back-up feed will only be used in event of failure of the primary clock feed from the CP. The CP will be responsible for providing and maintaining the timing source.

The BITS-In frequency port on the headend NTE is not supported.

The Street Access service supports Synchronous Ethernet as specified by ITU-T G.8261, ITU-T G.8262 and ITU-T G.8264 and Precision Time Protocol as specified by IEEE 1588v2 and ITU-T G.8275.1 Time and Phase Standard. Openreach Street Access product is a PTP aware Telecom Boundary Clock, supporting full on Path Support (SyncE ITU-T G.8261, ITU-T G.8262, ITU-T G.8264 and PTP ITU-T G.8275.1).

Street Access service does not provide the Primary Reference Time Clock (T-GM) or traceability back to the PRTC for both Phase/Time and Frequency traceability, but is only transporting Time and Phase with respect to the ITU-T G.8275.1 Telecom Profile standard.

It is the responsibility of the CP to provide Time and Phase Traceability back to their PRTC in their network. Traceability Flags are used as part of the PTP messages to convey status and indicate whether the T-BC is traceable back to the PRTC, or whether traceability has been lost. If the traceability flag indicates that the PTP flow is no longer traceable back to the PRTC, then this PTP Port/Flow would no longer be considered as valid reference input to the Openreach Equipment.

The standards that the Customer needs to adhere to are as below:

ITU-T G.8275.1

ITU-T G.8261

ITU-T G.8262

ITU-T G.8264

The ITU-T G.8275.1 Time and Phase Standard defines the full on-path protocol for the delivery of Frequency and Phase/Time. It is based on point to point Ethernet multicast communication between adjacent nodes (IP not supported by the profile).

There is a slight reduction in traffic throughput with SyncE and PTP enabled is expected. For example, where the link is used to transport 1G traffic, the maximum circuit throughput will be reduced from 999,680,000bps to 999,296,000bps, due to an additional 384kbps overhead for Sync traffic.

When G.8275.1 ITU-T T-BC is configured, 384kbps of bandwidth is automatically allocated for the PTP Flow and all PTP Messages on all Ports that are participating in the T-BC configuration.

VLAN Tags shall not be used with the Boundary Clock PTP Flow (G.8275.1 uses Multicast) – regardless of traffic tagging. The CP shall send in PTP un-tagged to the headend NTE.

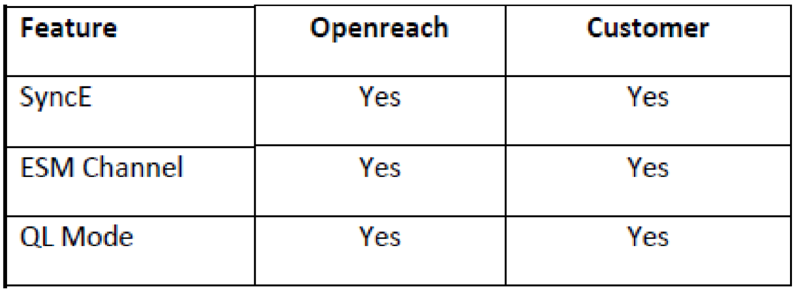
There will be Openreach Portal available to the customer for the Street Access service. Additional alarm notifications to the customer are to be confirmed, but likely to include a “PTP clock time not traceable” alarm. Time holdover is expected to be at least 1 hour for Boundary clock. Frequency SyncE holdover may be a number of hours.

On a SyncE/PTP enabled service, one additional frame per second will be sent with the customer traffic on the same remote end access port to provide information on the status of the synchronisation client interface. For the PTP component, 40 packets per second will be sent with the customer traffic on the same remote end access port to provide information on the status of the synchronisation client interface.

6.1 Timing Input Options

The customer traffic port is the only supported Synchronisation Input option. The first input should be fed by the customer in to circuit 1 (upper card slot – port 1). A backup timing feed (if the customer wishes to provide it) should be fed into the lower card slot – port 1. The Synchronisation output will be on the traffic on all circuits on the remote NTE (RJ45 output).

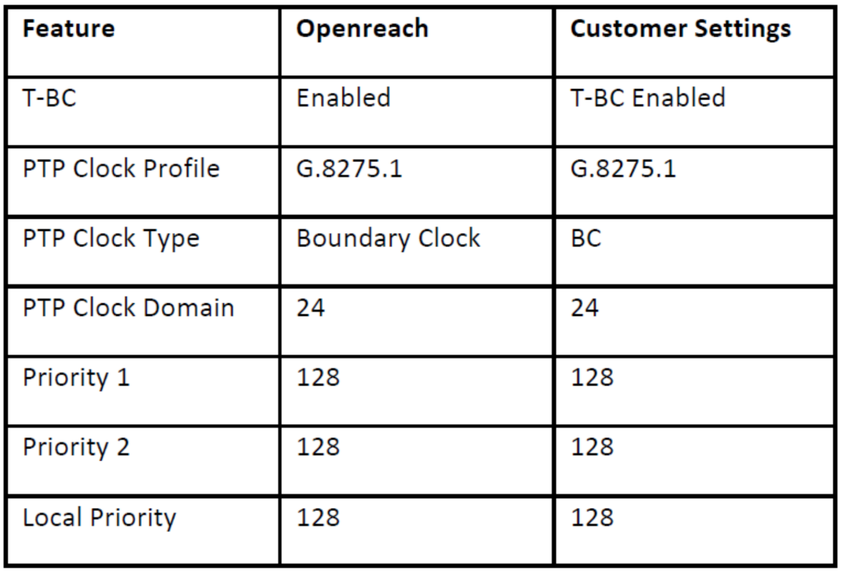
SyncE



Feature	Openreach	Customer
SyncE	Yes	Yes
ESM Channel	Yes	Yes
QL Mode	Yes	Yes

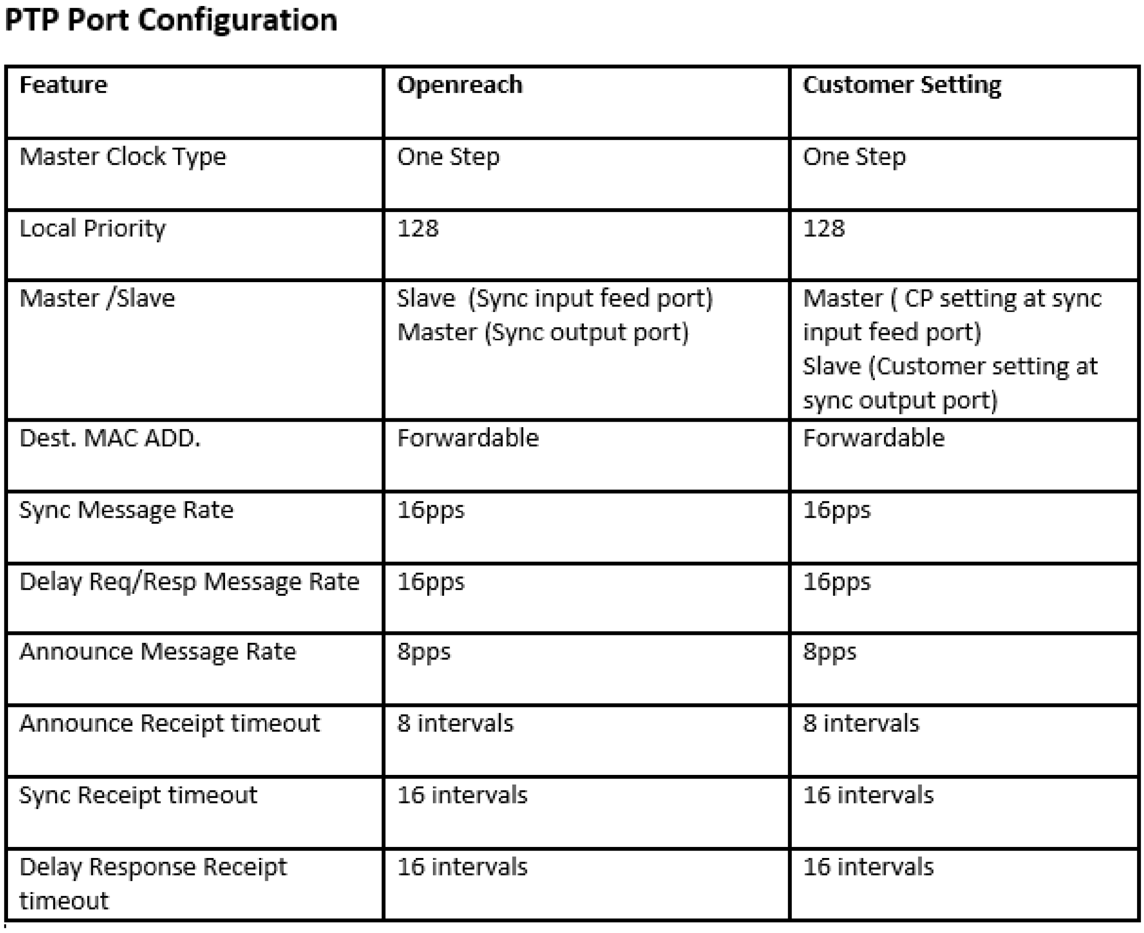
Table 1: SyncE

PTP Telecom-Boundary Clock Configuration



Feature	Openreach	Customer Settings
T-BC	Enabled	T-BC Enabled
PTP Clock Profile	G.8275.1	G.8275.1
PTP Clock Type	Boundary Clock	BC
PTP Clock Domain	24	24
Priority 1	128	128
Priority 2	128	128
Local Priority	128	128

Table 2: PTP Telecom- Boundary clock configuration



PTP Port Configuration

Feature	Openreach	Customer Setting
Master Clock Type	One Step	One Step
Local Priority	128	128
Master /Slave	Slave (Sync input feed port) Master (Sync output port)	Master (CP setting at sync input feed port) Slave (Customer setting at sync output port)
Dest. MAC ADD.	Forwardable	Forwardable
Sync Message Rate	16pps	16pps
Delay Req/Resp Message Rate	16pps	16pps
Announce Message Rate	8pps	8pps
Announce Receipt timeout	8 intervals	8 intervals
Sync Receipt timeout	16 intervals	16 intervals
Delay Response Receipt timeout	16 intervals	16 intervals

Table 3: PTP port configuration

Openreach Street Access Phase/Sync service conforms to the Class A T-BC clock as per G.8273.2 and has a max absolute time error of 100ns per NTE.

Therefore the Openreach service max absolute time error is 200ns.

7. References

Standards:

[1]	IEEE 802.3	Standards specification for Ethernet, physical communication in a local area network (LAN)
[2]	IEEE 802.1Q	Standard that supports virtual LANs (VLANs) on an IEEE 802.3 Ethernet network
[3]	IEEE 802.1ad	IEEE Standard for Local and Metropolitan Area Networks Virtual Bridged Local Area Networks

[4]	IEEE 802.3 as	IEEE standards for Local and Metropolitan Area Networks-Carrier Sense Multiple Access with Collision Detection (CSMA/CD) access method and physical layer specifications Amendment 3: Frame format extensions
[5]	IEEE 802.1 D	IEEE Recommendations for Bridging: Learning and Forwarding
[6]	ETSI 300 019	European standard for Environmental Engineering (EE); Environmental Conditions and Environmental Tests for Telecommunications Equipment
[7]	ITU-T G.8261	ITU standard for Timing and Synchronization Aspects in Packet Networks
[8]	ITU-T G.8262	ITU standard relating to Requirements for timing devices used in synchronizing network equipment that uses synchronous Ethernet
[9]	ITU-T G.8264	ITU standard for Distribution of timing information through packet networks and initially focuses on Ethernet networks.
[10]	ITU-T G.8275.1	Precision time protocol telecom profile for phase/time synchronization with full timing support from the network
[11]	ITU-T G.8273.2	Timing characteristics of telecom boundary clocks and telecom time slave clocks
[12]	ETSI EN 300 386	Telecommunication Network equipment; Electromagnetic Compatbility (EMC) requirements; Harmonised Standard covering the essential requirements of the Directive 2014/30/EU

British Standards:

[13]	BS 7671	(IET Wiring Regulations) sets the standards for electrical installation	

8. Abbreviations

AWG	American Wire Gauge – standardised wire gauge for electrical conductors
CP	Communications Provider
CPE	Customer Premise Equipment
IPR	Intellectual Property Rights
RJ45	Registered Jack 45 – data jack that can be used for Ethernet connectivity
MCB	Miniature Circuit Breaker
NTE	Network Terminal Equipment.
NTP	Network Time Protocol
LC	Lucent Connector – Miniaturised version of SC connector with 1.25mm ferrule
SELV	Safety Extra Low Voltage (<=60V DC)
SIN	Suppliers Information Note
STIN	Suppliers Trial Information Note (BT Publication)
VLAN	Virtual Local Area Network
LLF	Link Loss Forwarding
MDI-X	Medium Dependent Interface Crossover

9. History

Issue	Date	Changes
Issue 1.0	Dec 2019	First issue
Issue 1.1	Jan 2020	Clarification on EMC and mounting
Issue 1.2	April 2020	Change SINet site references from http://www.btplc.com/sinet/ to https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do
Issue 1.2	September 2021	Annual Review – no changes required – issue remains unchanged.
Issue 1.2	October 2022	Annual Review – branding and font changes only – issue remains unchanged.
Issue 1.2	October 2023	Annual Review – branding and font changes only – issue remains unchanged.
Issue 1.2	October 2025	Annual Review – no changes required – issue remains unchanged.

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